REALIZING THE PROMISE OF RENEWABLE ENERGY TO HELP REVITALIZE OUR WORLD

> *We do not inherit the earth from our ancestors. We borrow it from our children.*

In many ways, this Native American proverb goes powerfully to the heart of what the world is grappling with today. While there remain differences between nations on any number of geopolitical issues, a focus on actions needed to address climate change is nearly universal. It has become a lightning rod for innovation and investment from the public and private sectors. One area, in particular, appears to be acknowledged and embraced by the global community, which is the need to integrate renewable energy into the power ecosystem as a way to address many of the environmental issues we are confronting.

In a recent report from the U.S. Energy Information Agency (EIA), they predict that renewable generation, primarily wind and solar, will supply 44% of U.S. electricity by 2050.[1] It's also expected that solar will surpass wind as the primary renewable source in the 2030s as we see growth in commercial-scale solar farms and rooftop solar. Just one of the growth drivers for the proliferation of renewables can be found in a wide range of public policy actions taken by governments around the world, such as the recent passage of the Inflation Reduction Act (IRA) in the United States. The IRA earmarked $369 billion in investments, grants and clean energy tax credits. In addition to supporting investment in a wide range of industries across the electrification value chain, solar, in particular, is expected to benefit greatly. Targeted to reach 50 gigawatts (GW) of domestic manufacturing capacity

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by 2030, the IRA will play a key role in developing a full domestic solar supply chain. In 2021 alone, the U.S. installed 23.6 GW of solar capacity, a 19% increase from 2020. And that's just solar. Wind, hydro, geothermal, nuclear and hydrogen all have a role to play.[2]

A report by the International Energy Agency estimates that by 2026, global renewable electricity capacity is forecast to rise more than 60% from 2020 levels to over 4,800 GW—equivalent to the current total global power capacity of fossil fuels and nuclear combined. Renewables are set to account for almost 95% of the increase in global power capacity through 2026, with solar PV alone providing more than half. And it predicts that renewable energy sources such as solar and wind power, together with nuclear, will, on average, meet more than 90% of the increase in global demand by 2025.[3]

Analysts from the energy-focused exchange-traded fund (ETF), GlobalX, forecast global non-hydropower renewable electricity capacity could grow 195% over the coming decade, increasing from an estimated 2,064 GW at year-end 2022 to 6,060 GW in 2032. They also point out that nearly 135 countries have economy-wide net zero emissions targets.[4] And in a report from the international consulting firm McKinsey titled Global Energy Perspectives 2022, they estimate that by 2026, global renewable electricity capacity will rise more than 80% from 2020 levels to more than 5,022 GW. Of this growth, two-thirds will come from wind and solar, an increase of 150% (3,404 GW). By 2035, renewables will generate 60% of the world's electricity. They also estimate that electricity demand will see a 3X increase by 2050 as more sectors of the global economy adopt electrification in a move toward decarbonization.[5]

While the numbers may vary, study after study supports the growth trajectory of renewable energy as a solution to controlling global warming, climate change and increasing resiliency in the power grid. And as renewable energy plays a larger role as a source of power for the grid, the complexity of successful integration and resource management increases. Combined, these factors necessitate an increase in demand for battery-based energy storage. The promise of renewable energy cannot be realized without the widespread integration of battery storage. In the same EIA report referenced earlier, when looking at the capacity of battery storage systems as compared with 2021, capacity additions from battery storage in 2022 rose by over 80% in the United States, almost 100% in China, roughly 35% in Europe, 90% in OECD Pacific (i.e., Japan, Korea, Australia and New Zealand) and about sixfold in EMDEs, excluding

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China. In 2022, the largest fleet of cumulative battery systems installed remains in the United States, while China surpassed Europe in cumulative capacity, reaching a total of 10,500 MW compared to Europe's 9,400 MW.[2] Battery storage brings balance, consistency and reliability to electricity systems by helping manage fluctuations in renewable energy availability. The need to optimize storage with other components of the electricity ecosystem, combined with managing increasingly unforeseen climate and weather-related events that impact demand and supply, requires step-change advances in analytical devices and smart, connected networks to optimize the efficiency and reliability of our future power systems. Battery storage systems store energy during times when it is abundant and release it when it is needed. Next-generation advanced metering infrastructure, smart meters and edge computing and analytics will be critical to delivering the full benefits of renewable energy and battery storage as they work to manage intermittency and peak demand, increase grid reliability and security and enable the decentralization and integration of renewable energy sources into the grid.

But the integration of battery storage is not without its challenges. Innovation is still needed in both lithium-ion batteries and flow batteries. In addition, the supply chains that support the production of these energy storage options are currently constrained by the availability or scarcity, and subsequently the cost, of critical minerals such as lithium, cobalt and nickel, among others.

Despite these challenges, at Honeywell, we believe there is an inevitability connected to the ingenuity of the human spirit to find solutions to our greatest challenges. It's part of our DNA as an organization, and we're applying it to developing innovations designed to harness the power of renewable energy and battery storage to address climate change and help us move to a decarbonized world. Our Smart Energy devices, edge computing platforms and connected enterprise solutions are focused on helping our customers not just survive but thrive in this rapidly evolving energy ecosystem.

1. https://www.eia.gov/todayinenergy/detail.php?id=51698#
2. https://www.ey.com/en_us/energy-resources/3-key-attributes-of-the-us-renewables-landscape
3. https://iea.blob.core.windows.net/assets/255e9cba-da84-4681-8c1f-458ca1a3d9ca/ElectricityMarketReport2023.pdf
4. Net Zero Tracker. (n.d.). Net Zero Tracker: Net Zero Numbers. Accessed on February 8, 2023
5. https://www.mckinsey.com/industries/oil-and-gas/our-insights/global-energy-perspective-2022

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